New Nouveau
Brunswick

91-04134/

Reference 34

Preliminary Review of New Brunswick's Mineral Industry

1990

Edited by

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Natural Resources and Energy

Mineral Resources

March, 1991

This report should be referenced in the following manner:

CARROLL, B.M.W. (editor) 1991. Preliminary review of New Brunswick's mineral industry, 1990. New Brunswick Department of Natural Resources and Energy, Mineral Resources, Reference 34, 22 p.

Department of Natural Resources and Energy
Fredericton, New Brunswick

To all user groups:

I take great pride in presenting, on behalf of the Department of Natural Resources and Energy, the "Preliminary Review of New Brunswick's Mineral Industry - 1990."

This report demonstrates, once again, the importance of minerals in the provincial economy. Overall, 1990 was a good year for the industry and, from all indications, 1991 will be even better.

I would like to thank you for your continued support and hope that this document will be of use to the mining community.

Yours sincerely,

Edmond P. Blanchard

EDMOND P. BLANCHARD
Minister of State for Mines

Ministère des Ressources naturelles et de l'Énergie
Fredericton (Nouveau-Brunswick)

À l'attention de tous les utilisateurs
Madame, Monsieur,

Au nom du ministère des Ressources naturelles et de l'Énergie, j'ai le grand honneur de vous présenter le Rapport préliminaire de l'industrie des minéraux du Nouveau-Brunswick - 1990.

Ce rapport démontre, une fois encore, l'importance des minéraux pour l'économie provinciale. Dans l'ensemble, 1990 a été une bonne année pour cette industrie et, d'après tous les indices, 1991 sera encore meilleure.

Je tiens à vous remercier de votre soutien ininterrompu et j'espère que ce document pourra être utile à l'ensemble de la communauté minière.

Veuillez agréer, Madame, Monsieur,
l'expression de mes sentiments les meilleurs.

Le ministre d'État aux Mines,

Edmond P. Blanchard

EDMOND P. BLANCHARD

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ABSTRACT

The value of New Brunswick's mineral production is estimated to be $886 095 000, an increase of 2.5% over 1989. Zinc, lead, and copper contributed 63.5% of the total value. Increased zinc production is attributed to the Heath Steele and Caribou mines; lead and copper production decreased. Gold and silver contributed 3.6% of the total value of production. Gold production increased (100%) mainly because of the Murray Brook mine. The value of silver production declined 50%, due to less production and poor prices. Antimony contributed little because of the closure of the Lake George antimony mine in January.

During the year, the Caribou mine was closed because of low zinc prices, the economic recession and events in the Persian Gulf. Marshall Minerals Corp. did not proceed with development of the Restigouche deposit because of the lengthy Environmental Impact Assessment process, low zinc prices, and the closure of the Caribou operation. In July, workers at the Brunswick No. 12 mine went on strike. The dispute was not settled by year's end.

Nonmetallic minerals contributed 23% to the value of production. The main commodities include potash, peat, and sulphur.

Fuels production, mainly coal, was valued at $37 400 000. N.B. Coal Limited has achieved its goal of reclaiming lands disturbed since 1978.

Structural materials such as lime, stone, clay, and sand and gravel contributed about 5% to the value of production. In February, L.E. Shaw Limited closed its brick manufacturing facility at Chipman.

In 1990, approximately 50 companies spent $16 700 000 exploring for minerals in the Province. Brunswick Mining and Smelting Corporation Limited and Noranda Exploration Company, Limited were the largest contributors. The focus was base metals and gold in the Bathurst camp and the adjacent Sewell Brook area, and gold deposits in the St. Croix-Annidale, Mascarene-Nerepis, and Cape Spencer terranes of southern New Brunswick.

Two deposits were discovered in northern New Brunswick. One is 2 km north of the Brunswick No. 12 mine where initial drilling intersected 8.5 m of zinc, lead, copper and silver. The second discovery was in Devonian volcanic rocks near Sewell Brook. Initial drilling indicated a zone 499 m long and up to 5.7 m wide containing zinc, lead, and silver. This deposit stimulated a staking rush in the region, where nearly 1200 new claims had been staked by year's end.

RÉSUMÉ

La valeur de la production de minéraux du Nouveau-Brunswick en 1990 est estimée à 886 095 000 $, ce qui représente une augmentation de 2,5 % par rapport à 1989. La pproduction de zinc, de plomb et de cuivre est évaluée à 63,5 % de la valeur totale.

L'augmentation de la production de zinc est attribuable au rendement des mines Heath Steele et Caribou. L'or et l'argent ont fourni 3,6 % de la valeur totale. La production d'or a augmentée de 100 %, principalement en raison du rendement de la mine Murray Brook. La valeur de l'argent a par ailleurs chuté de 50 % en raison d'une baisse de production et de la faiblesse des prix. L'antimoine est à peu près absent de la production en raison de la fermeture de la mine d'antimoine de Lake George, en janvier 1990.

La mine Caribou a dû fermer ses portes au cours de l'année en raison de la faiblesse des prix, de la récession économique et des événements du golfe Persique. Marshall Minerals Corp. n'a pas pu entamer l'exploitation du gisement Restigouche en raison de la longueur de l'étude sur l'impact environnemental, du faible prix du zinc et de la fermeture de la mine Caribou. En juillet, les employés de la mine Brunswick n° 12 se sont mis en grève. Ce conflit de travail n'avait toujours pas été résolu à la fin de l'année.

La production de minéraux non métalliques a fourni 23 % de la valeur totale. Parmi les principaux produits, on trouve la potasse, la tourbe et le soufre.

La production de combustibles, principalement du charbon, est évaluée à 37 400 000 $. N.B. Coal Limited a réalisé ses objectifs en terminant la restauration de toutes les terres qui avaient été perturbées depuis 1978.

La production de matériaux de gros oeuvre comme la chaux, la pierre, l'argile, le sable et le gravier a contribué à environ 5 % de la valeur totale. En février 1990, L.E. Shaw Limited fermait son usine de briques de Chipman.

En 1990, un cinquantaine d'entreprises ont investi quelque 16 700 000 $ pour la prospection de minéraux dans la province. Brunswick Mining and Smelting Corporation Limited et Noranda Exploration Company, Limited étaient les deux chefs de file dans ce domaine. Les recherches ont porté principalement sur les métaux communs et l'or dans la région de Bathurst et de Sewell Brook, et sur les gisements d'or des régions de St. Croix-Annidale, Mascarene-Nerepis et Cape Spencer, dans le sud du Nouveau-Brunswick.

Deux nouveaux gisements ont été découverts dans le nord de la province. Un de ces gisements est situé à deux kilomètres au nord de la mine Brunswick n° 12. Les forages initiaux ont révélé la présence de 8,5 mètres de zinc, de plomb, de cuivre et d'argent. La deuxième découverte a eu lieu dans un strate de roche volcanique datant du dévonian, tout près de Sewell Brook. Les forages initiaux indiquent la présence d'un gisement s'étendant sur 499 mètres de longueur et atteignent jusqu'à 5,7 mètres de largeur, qui contient du zinc, du plomb et de l'argent. La découverte de ce gisement a engendré une mini-ruée de la part des prospecteurs et 1200 nouveaux claims avaient été jalonnés dans la région à la fin de l'année.

PRELIMINARY REVIEW OF NEW BRUNSWICK'S MINERAL INDUSTRY 1990

EXPLORATION

Metallic Minerals

Preliminary estimates indicate that exploration expenditures in the province in 1990 reached $16 700 000. Once again, Noranda Exploration Company, Limited and Brunswick Mining and Smelting Corporation Limited were major contributors to this total. By the end of 1990, 21 744 mineral claims and 9324 claim equivalents were in good standing in the Province. Exploration activity was concentrated in the Bathurst camp and Sewell Brook area of northern New Brunswick, and the Annidale-Nerepis and Cape Spencer areas in southern New Brunswick (Figure 1).

Northern New Brunswick The most encouraging news in base metal and gold exploration came from northern New Brunswick. In the latter part of 1989, **Brunswick Mining and Smelting Corporation Limited** announced that a drill hole into the "northend zone," 2 km north of the No. 12 mine (Figure 2: 1), had intersected 8.5 m of massive sulphides grading 9.9% zinc, 4.6% lead, 0.22% copper, and 183.4 g/t silver at a depth of 1100 m. Since then, 9619 m of surface and 2225 m of underground drilling have outlined an ore deposit with a 200 m strike length, 170 m vertical height, and 8.5 m thickness. This discovery is directly linked to predictions made on the basis of detailed geological mapping by C.R. van Staal of the Geological Survey of Canada. Until this discovery by Brunswick, the numerous massive sulphide deposits found in the Tetagouche volcanic complex over 38 years of exploration were relatively easy to locate; however, the challenge of the 1990s will be to explore for deep-seated ("blind") deposits that are much more difficult to find. The Brunswick discovery demonstrates that high-quality geological maps generated by government will be the principal tool in the search for similar deposits elsewhere. There probably will be an acceleration in exploration associated with this search because 1990 was the first year since mining began in 1966 that the Brunswick No. 12 ore reserves declined.

The second highlight of 1990 was provided by **NovaGold Resources Inc.**, who announced the discovery of an important base metal deposit in the Sewell Brook area (Figure 3: 1), Victoria County, approximately 25 km northeast of the town of Plaster Rock. By late November, 12 drill holes had outlined a northerly trending mineralized structure some 499 m long and up to 5.7 m wide, grading 36% to 41% zinc-plus-lead and up to 130 g/t silver. The company obtained the original claims to investigate geological targets arising from mapping by the Geological Surveys Branch of the New Brunswick Department of Natural Resources and Energy. The discovery has resulted in a staking "rush" involving **NovaGold Resources Inc., Placer Dome Incorporated, Noranda Exploration Company, Limited, BHP-Utah Mines Ltd.**, and others. At year's end, approximately 1200 new claims had been staked in the area.

The nature of the deposit is not clear; however, it is certain that mineralization occurs in Devonian volcanic and sedimentary rocks flanking the Tetagouche volcanic complex, which hosts the well known "Bathurst-type" massive sulphide deposits.

Heath Steele Mines (a Division of Brunswick Mining and Smelting Corporation Limited) continued to define reserves in the Stratmat S-1 and the Heath Steele "C" zones

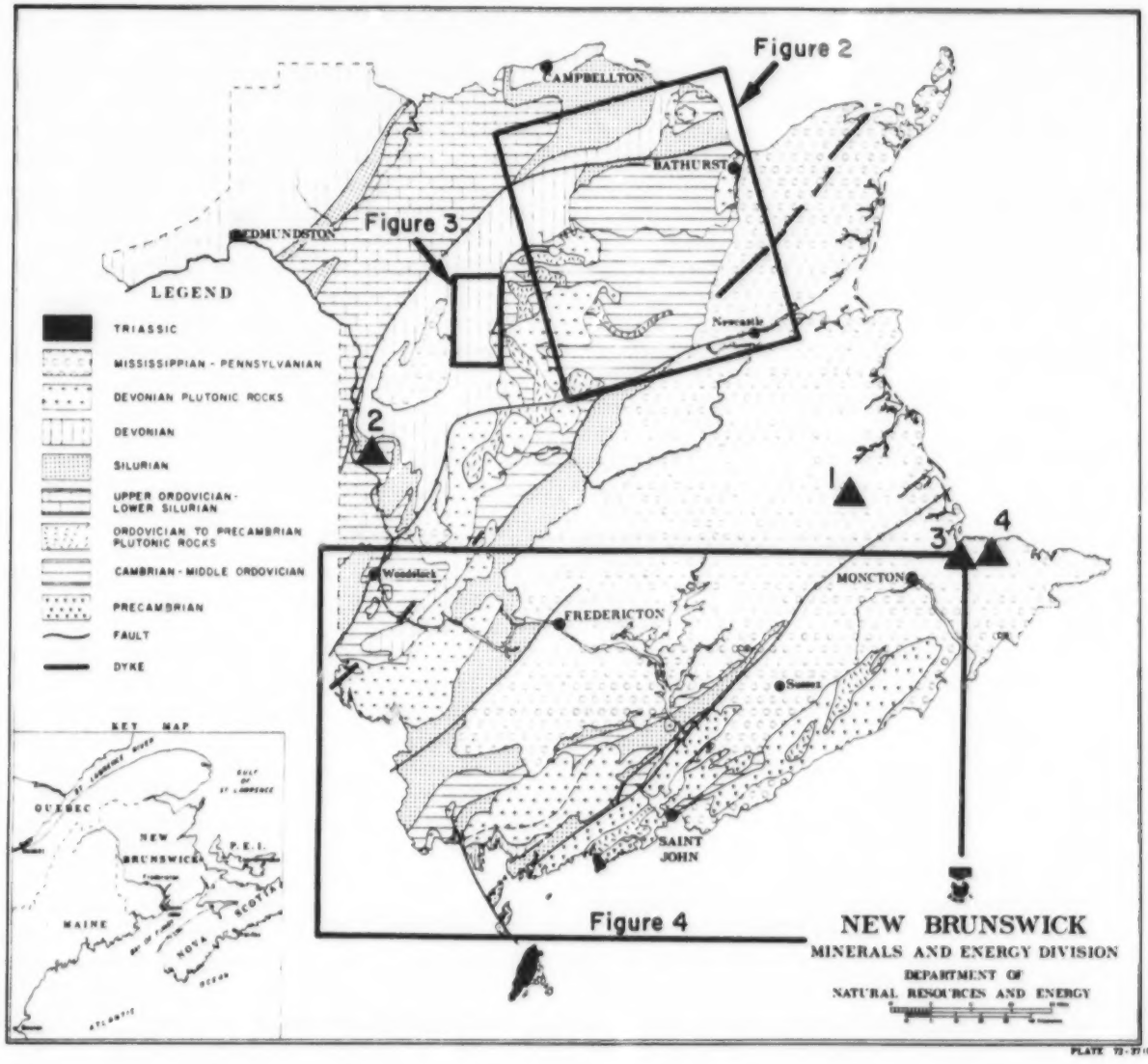


Figure 1. Generalized geology of New Brunswick. The outlined areas are: the Bathurst camp (Figure 2), the Sewell Brook area (Figure 3), and southern New Brunswick (Figure 4).

1. **Beersville deposit (N.B. Power) coal**
2. **White Mud Lake (Upper Kent Lime Works Ltd.) marl**
3. **Shediac (Smith Cut Stone and Quarries Ltd.) dimension stone**
4. **Shediac (Dupuis Cut Stone Ltd.) dimension stone**

(Figure 2: 2,3). The latter comprises 1 790 000 t of ore grading 7.42% zinc, 1.37% lead, 0.84% copper and 61.52 g/t silver. A near-surface extension of the C lens was also found.

Falconbridge Limited completed a drilling programme on its Nash Creek zinc-lead prospect (Figure 2: 4) hosted by Devonian volcanic and sedimentary rocks. The Nepisiguit claim group (Figure 2: 5), in the western part of the Tetagouche volcanic complex, was also investigated.

Rio Algom Exploration Inc. conducted gravity surveys, trenching and stratigraphic drilling on its Nepisiguit Brook property (Figure 2: 6). The company also acquired claims in the vicinity of the old Wedge mine (Figure 2: 7).

Granges Exploration Ltd. continued drilling on its Maliseet Mountain property (Figure 2: 8).

Corona Corporation carried out trenching on its Sheephouse Brook property (Figure 2: 9).

NovaGold Resources Inc. conducted a "deep-EM" survey on its Murray Brook gold property and its Mullin Stream and California Lake base-metal properties (Figure 2: 10,11,12). The company also trenched and drilled a precious-metal-bearing hydrothermal breccia zone near the upper reaches of Middle River (Figure 2: 13).

Noramco Management, a subsidiary of Breakwater Resources Ltd., explored in the vicinity of the Caribou mine (Figure 2: 14) and investigated its McMaster and Armstrong B properties (Figure 2: 15,16).

Key Anacon Mines Limited drilled four holes to test geophysical anomalies east of the Key Anacon deposit and beneath Carboniferous cover rocks (Figure 2: 17).

Tillicum Resources explored the Nine Mile Brook property for gold (Figure 2: 18).

Consolidated Rhodes Resources Inc. investigated the Captain base-metal property (Figure 2: 19).

PGE Resource Corp. trenched several targets on claims in the Clearwater Stream-North Sevogle River area (Figure 2: 20).

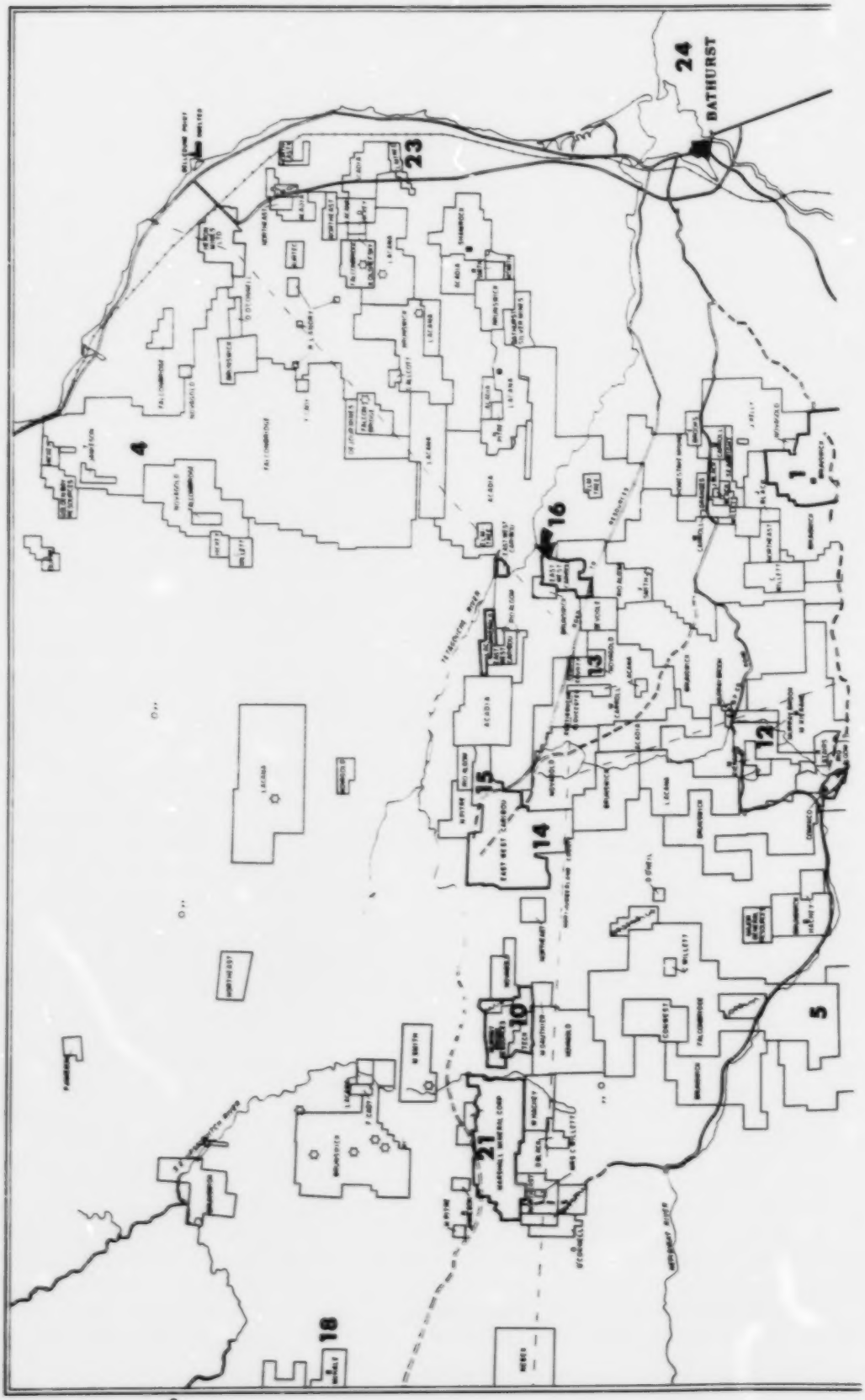
Other companies who held claims during 1990 include **NEBEX Resources Ltd., Teck Corporation, Acadia Mineral Ventures Limited, Seabright Exploration Inc., Sharpe Energy and Resources Limited, Jonpol Explorations Limited, Tintina Mines Limited, Four Seasons Resources Limited, Shamrock Resources Inc., Sevogle Exploration Inc., Aurtec Mining Development Inc.** and **Costigan Gold Corp.**

Southern New Brunswick In the southern half of the Province, gold exploration was again concentrated in the St. Croix-Annidale and Mascarene-Nerepis zones and the Bay of Fundy gold belt (Figure 4).

Gold and platinum-palladium exploration remained active in the Caledonia (Avalon) zone along the Bay of Fundy coast and in the St. Croix-Annidale zone between the town of St. Stephen and the settlement of Annidale. Base metal exploration also was revived in these areas.

Hecla Mining Company of Canada Ltd. conducted a detailed induced polarization and a basal till geochemical survey on the Mispec Resources Inc. property (Figure 4: 1) in order to prepare for an extensive diamond-drilling programme designed to extend the known ore reserves of the property. **Glenvet Resources Limited** and **Neptune Resources Ltd.** also explored claims in the Golden Grove and Cape Spencer-Black River areas, respectively (Figure 4: 2,3).

Within the Caledonia zone at Mechanic Settlement (Figure 4: 4), **Noranda Exploration Company, Limited** acquired the platinum-palladium prospect of PGE Resource Corp. where platinum-group elements occur in a Precambrian mafic-ultramafic intrusive complex. Diamond drilling was planned to begin early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BATHURST
23
4
1
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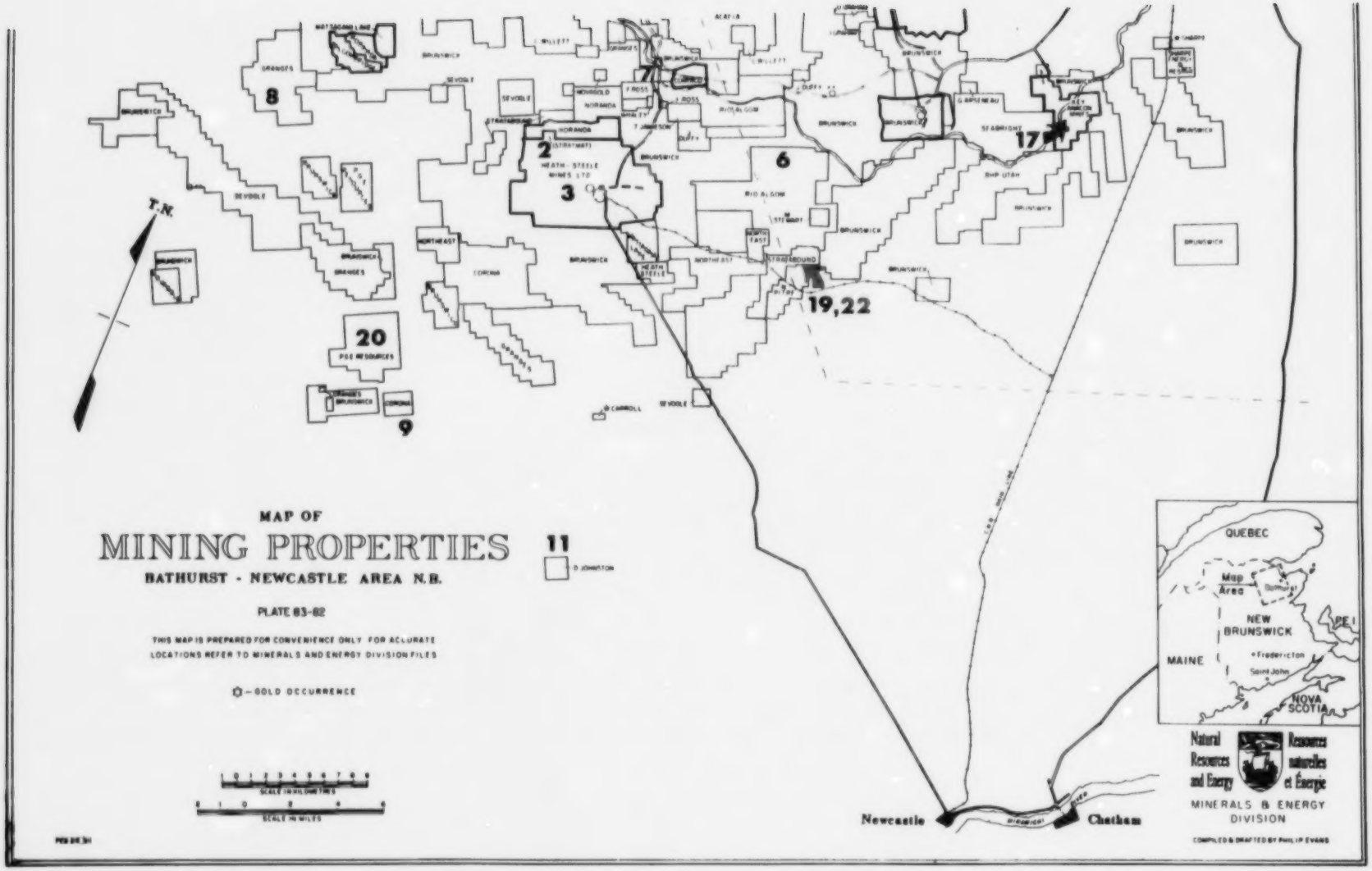

Figure 2. Mineral properties in the Bathurst camp, northern New Brunswick (February, 1991). The legend is on the next page. See Figure 1 for location map.

LEGEND

1. Brunswick No. 12 mine (Brunswick Mining and Smelting Corporation Limited) zinc, lead
2. Stratmat S-1 deposit (Heath Steele Mines) zinc, lead, silver, copper
3. Heath Steele mine (Heath Steele Mines) zinc, lead, silver, copper
4. Claims, Nash Creek (Falconbridge Limited)
5. Claims, Nepisiguit (Falconbridge Limited)
6. Claims, Nepisiguit Brook (Rio Algom Exploration Inc.)
7. Claims, Wedge mine area (Rio Algom Exploration Inc.)
8. Claims, Maliseet Mountain (Granges Exploration Ltd.)
9. Claims, Sheephouse Brook (Corona Corporation)
10. Murray Brook deposit (NovaGold Resources Inc.) base metals, gold, silver
11. Claims, Mullin Stream (NovaGold Resources Inc.)
12. Claims, California Lake (NovaGold Resources Inc.)
13. Claims, South Branch Middle River (NovaGold Resources Inc.)
14. Caribou mine (East West Caribou Mining Limited) zinc, lead
15. Claims, McMaster (Noramco Management)
16. Claims, Armstrong (Normaco Management)
17. Claims, east of Key Anacon deposit (Key Anacon Mines Limited)
18. Claims, Nine Mile Brook (Barry McHale)
19. Captain deposit (Norman Pitre) massive sulphides
20. Claims, Clearwater Stream-North Sevogle River area (PGE Resource Corp.)
21. Restigouche deposit (Marshall Minerals Corp.) zinc, lead, silver
22. Captain North Extension (N. Pitre/Stratabound Minerals Corp.) massive sulphides
23. Elmtree deposit (Elmtree Resources Ltd.) limestone
24. Bass River deposit (Elmtree Resources Ltd.) silica

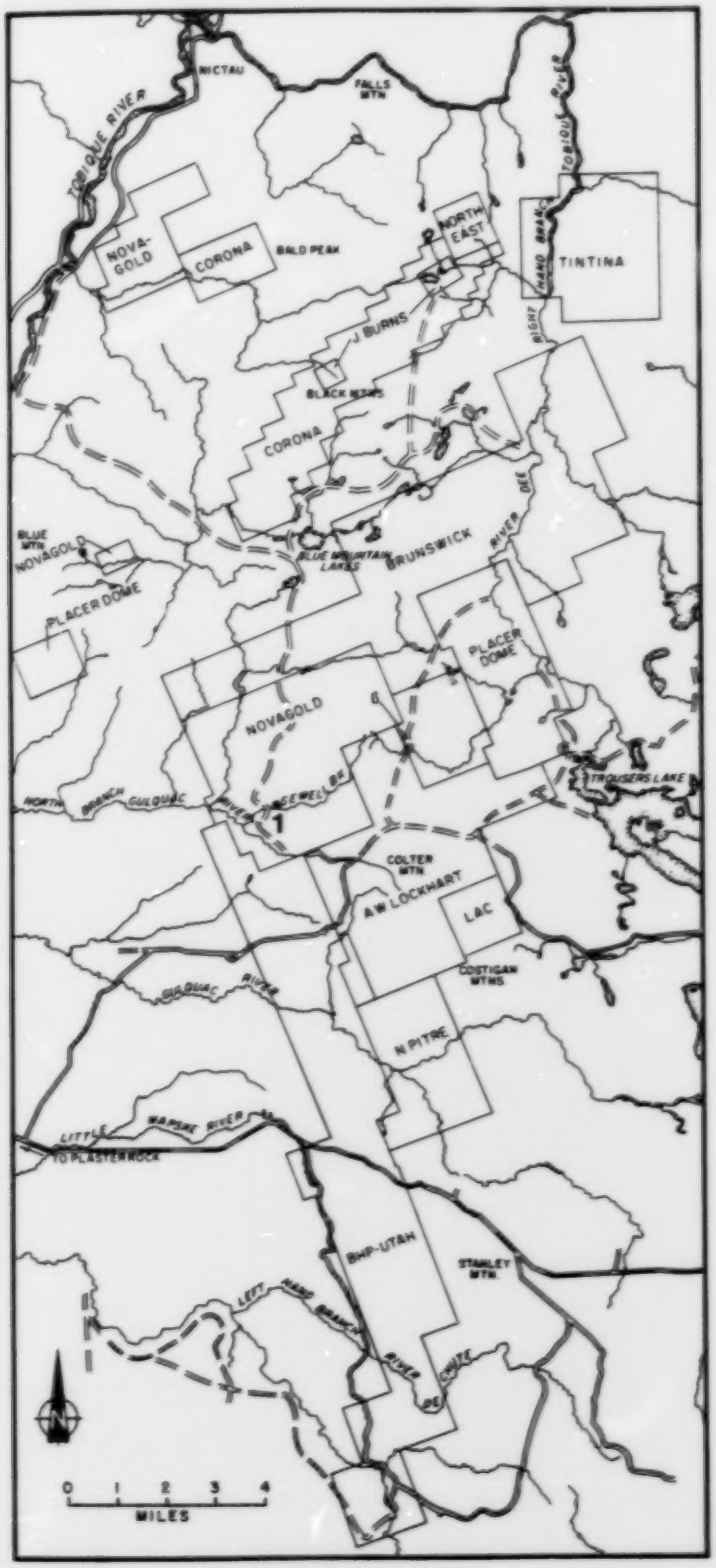

Figure 3. Mineral claims staked in the Trousers Lake area of northern New Brunswick. See Figure 1 for location map.

1. Sewell Brook deposit (NovaGold Resources Inc.) zinc, lead, silver

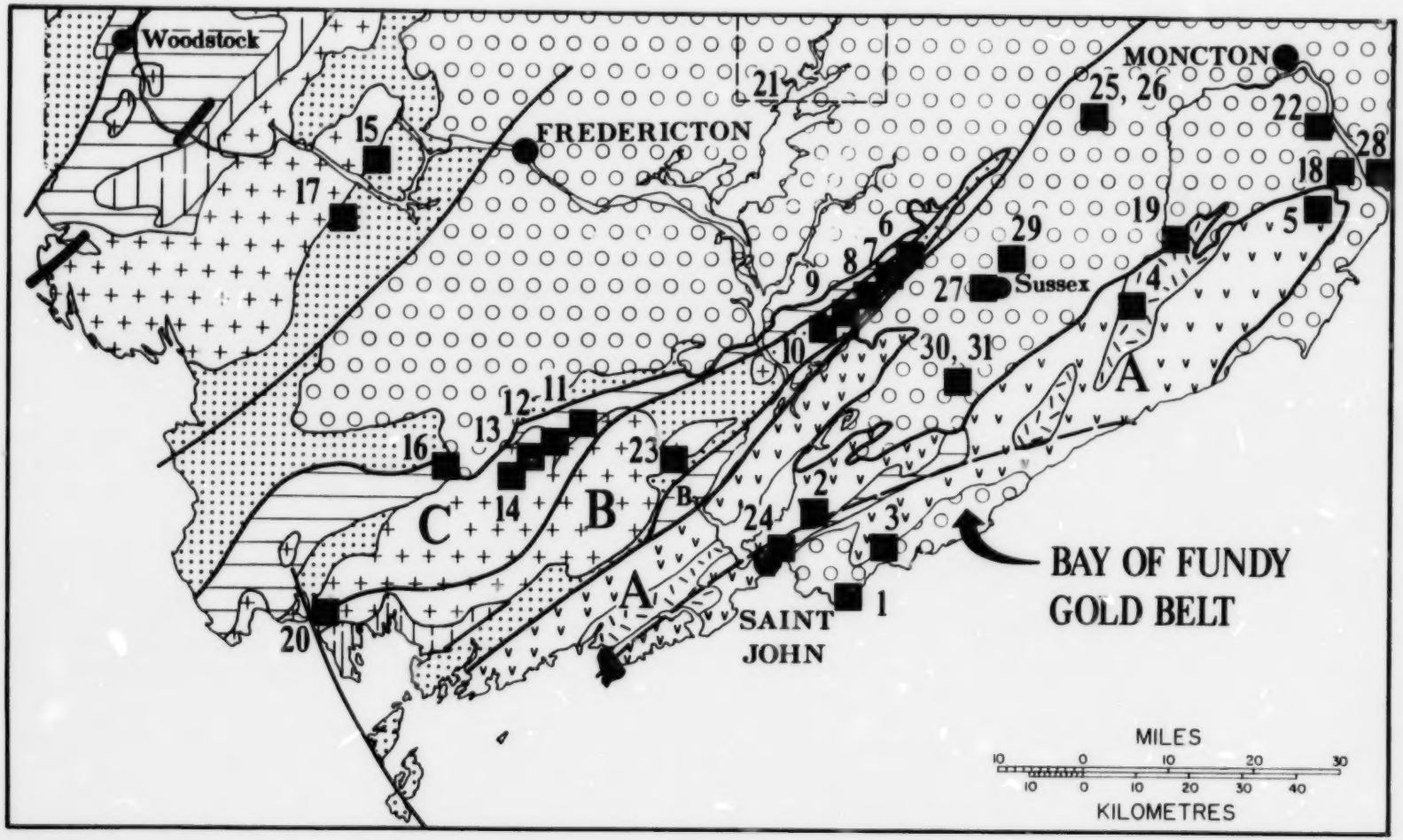

Figure 4. Mineral properties in southern New Brunswick in 1990. See Figure 1 for location map.

LEGEND

A - Caledonia zone
B - Mascarene-Nerepis zone
C - St. Croix-Annidale zone

1. Claims, Cape Spencer area (Mispec Resources Inc.)
2. Claims, Golden Grove (Glenvet Resources Limited)
3. Claims, Marigold (Neptune Resources Ltd.)
4. Claims, Mechanic Settlement (Noranda Exploration Company, Limited)
5. Claims, Rosevale (Falconbridge Limited)
6. Claims, Annidale (LAC Minerals Ltd.)
7. Claims, Ketchum Brook (BP Resources Canada Limited)
8. Claims, Henderson Settlement (Brunswick Mining and Smelting Corporation Limited)
9. Claims, Henderson Settlement (PGE Resource Corp.)
10. Claims, Albright Brook (Maritime Resource Research Ltd.)
11. Claims, Bald Hill (Brunswick Mining and Smelting Corporation Limited)
12. Claims, Sand Brook Mountain (Grand Empire Exploration Limited)
13. Claims, Jimmy Hill (Goldfluor Exploration Ltd.)
14. Claims, McDougall Lake Extension (Brunswick Mining and Smelting Corporation Limited)
15. Claims, Scotch Lake Grid (Brunswick Mining and Smelting Corporation Limited)
16. Mount Pleasant deposit (LAC Minerals Ltd./Billiton Metals Canada Ltd.) tin, tungsten
17. Lake George mine (Dominion Explorers Inc.) antimony
18. Hillsborough area (Eastern Gypsum Inc.) gypsum
19. Elgin (The Tucker Mountain Stone and Boulder Company) aggregate
20. Bayside (L.E. Shaw Limited) aggregate
21. Minto-Chipman area (N.B. Coal Limited) coal
22. Stoney Creek field (Irving Oil Limited) natural gas
23. Blagdon (Brunswick Ready-Mix Concrete Ltd.) granular aggregate
24. Brookville (Brookville Manufacturing Company Ltd.) limestone
25. Havelock area (Lafarge Canada Inc.) limestone
26. Havelock (Havelock Lime) limestone
27. Sussex (Nelson Monuments Ltd.) dimension stone
28. Fort Folly Point area (Maritime Stoneworks Ltd.) dimension stone
29. Sussex area (Potash Company of America) potash
30. Salt Springs (Denison-Potacan Potash Company) potash
31. Cassidy Lake (Sussex Silica Limited) silica

in December.

Falconbridge Limited staked a large claim group in the extreme northeastern part of the Caledonia zone, west of Albert Mines (Figure 4: 5), to cover several stratiform base-metal sulphide occurrences in Precambrian mafic-felsic volcanic rocks. The geological setting of these occurrences is similar to that of the Mindamar deposit in southern Cape Breton, which was mined in the 1950s.

Numerous companies and prospectors actively explored the complex faulted boundary between the St. Croix-Annidale and Mascarene-Nerepis zones (Figure 4). Recent geological mapping and radiometric dating have shown that much of the St. Croix-Annidale zone is underlain by intensely deformed Ordovician mafic-felsic volcanic and sedimentary rocks. This has made the area attractive not only for gold, but also for base-metal sulphides.

About two years ago, LAC Minerals Ltd. discovered a prominent gold-bearing shear zone in the Annidale area, along the northeastern St. Croix-Annidale - Mascarene-Nerepis boundary. One hole drilled in this shear zone assayed 3.12 g/t Au over 1.52 m. LAC's claims were subsequently optioned by **Inco Gold Company** (Figure 4: 6). Following this discovery, **BP Resources Canada Limited, Brunswick Mining and Smelting Corporation Limited, PGE Resource Corp., and Maritime Resource Research Ltd.** staked extensive groups of claims in this area (Figure 4: 7-10).

In the South Oromocto Lake area, farther to the southwest in the same zone, prospector William Carter found a gold-bearing outcrop that yielded an assay of 7.5 g/t gold. **Brunswick Mining and Smelting Corporation Limited** optioned this prospect and staked an additional group of claims (Figure 4: 11).

Grand Empire Exploration Limited conducted a diamond drilling programme on its claim group southwest of the Carter prospect on Sand Brook Mountain (Figure 4: 12), but the results are still confidential. Dr. Winfried Brack discovered a gold-arsenopyrite-bearing quartz vein on this property. Two samples from the vein assayed 17.83 and 2.74 g/t gold.

Goldfluor Exploration Ltd. found several gold-bearing quartz veins at Jimmy Hill (Figure 4: 13), west of Sand Brook Mountain. Chip samples across one of the veins and into the wall rocks assayed 8.95 g/t gold over 1.3 m, 4.25 g/t gold over 1.3 m, and 17.18 g/t gold over 20 cm.

West of Jimmy Hill in the Little McDougall Lake area (Figure 4: 14), **Brunswick Mining and Smelting Corporation Limited** staked a claim group in Ordovician metasedimentary rocks and rhyolite tuff. This ground has potential for stratiform base-metal-sulphide deposits. Similar rocks along strike in the State of Maine host the Blue Hill base-metal-sulphide deposit, which was mined in the 1970s.

Brunswick Mining and Smelting Corporation Limited explored claims in the Lower Caverhill-Springfield area (Figure 4: 15) in the northeastern contact aureole of the Pokiok Batholith, about 30 km west of the City of Fredericton. This area has potential for gold- and scheelite-bearing skarns associated with Late Silurian-Early Devonian granodiorite intrusions emplaced in intensely deformed calcareous siltstones and sandstones. The company conducted a till-geochemical survey and did some trenching on the property. Results have not been made public.

NovaGold Resources Inc. optioned the Mount Pleasant tin-tungsten-molybdenum property (Figure 4: 16), about 35 km north of the Town of St. George in southwestern New Brunswick. The company drilled three holes in the saddle between the Fire Tower and North zones. These drill holes confirmed the presence of a third major zone on the property. Previous

surface and underground exploration delineated 4 600 000 t of reserves averaging 0.79% tin. Metallurgical testing of the tin ores is also in progress at Lakefield Research in Ontario, and at the Canmet Laboratory of the Canada Department of Energy, Mines and Resources in Ottawa.

In 1990, **Dominion Explorers** Inc. closed the Lake George stibnite mine (Figure 4: 17), Canada's only antimony mine. To assist with the exploration for new stibnite-gold deposits, Mineral Resources geologists are carrying out detailed geological mapping in the area. Funds for this work are being provided by a Canada - New Brunswick Co-operative Agreement on Mineral Development (CAMD) signed in 1990.

Fuels

N.B. Power continued to assess the development potential of the Beersville coal deposit (Figure 1: 1). A test pit was excavated and a bulk sample was obtained.

Industrial Minerals

Exploration and some predevelopment activity is being conducted in southern New Brunswick by **Eastern Gypsum Inc.**, who is searching for a suitable indigenous source of wallboard-quality gypsum. The material is to be used as feedstock for a new state-of-the-art wallboard manufacturing facility at McAdam, 65 km southwest of Fredericton. The plant opened in the fall of 1990. Extensive examination of deposits in the Hillsborough area (Figure 4: 18) is in progress to confirm the extent and quality of the gypsum resource and its suitability in the proposed manufacturing process.

Dimension stone exploration is also underway in northern New Brunswick.

An exploration programme was conducted on deposits of black granite north of the village of St. George in Charlotte County.

The proposed installation of a sulphur gas desulphurization system at the Belledune power generating station has sparked interest in the Province's limestone resource. The capture of SO_2 utilizing wet limestone slurry (i.e., scrubber) technology requires high-grade limestone to act as sulphur capture medium. Location, quality, and quantity of local and Newfoundland limestone have been identified and assessed as to their suitability. The power utility is estimated to annually consume up to 150 000 t of limestone (minimum 90% $CaCO_3$) for every 450 mW unit of power produced.

Work is also underway to investigate the potential use of byproduct gypsum from phosphogypsum and flue gas desulphurization gypsum.

Mineral Lands

The total number of claims staked in 1990 was 4361, down 50% from the 1989 total of 8736 (Table 1, Figure 5). At the end of the year, there were 21 744 claims, 6 coal agreements (5789 claim equivalents), 2 other agreements (226 claim equivalents), 3 potash leases (2382 claim equivalents), and 15 mining leases (927 claim equivalents) in effect, which represent a total claim equivalent of 31 068 (down 1% from 1989). Exploration expenditures reported in assessment reports submitted in 1990 was $6 036 321 (Table 1).

DEPOSITS BEING DEVELOPED

Metallic Minerals

During 1989-90, mine development in the Province peaked and then levelled off, generally following the trend of base metal prices. The

TABLE 1. MINERAL LANDS AND EXPLORATION STATISTICS, 1990

MINERAL LANDS (total in effect at year's end unless specified for 1990)	No.	Claim Equivalent	Hectares	% Inc. Over Prev. Year* (Decrease)
Prospecting Licences	851	-	-	16
Claims Recorded, 1990	4 361	-	69 776	(50)
Claims Renewed, 1990	17 383	-	278 128	38
Claims Expired, 1990	4 609	-	73 744	61
Claims in Effect	21 744	-	347 904	(1)
Coal Agreements	6	5 789	92 624	N/A
Other Agreements	2	226	3 616	-
Potash Leases	3	2 382	38 108	0
Other Leases	15	927	14 832	0
Total Claims and Claim Equivalents	-	31 068	084	(1)
Oil-Gas Licences	-	-	-	0
Oil-Gas Leases	4	-	13 289	0
Bituminous Shale Licences	1	-	8 973.1	-
Bituminous Shale Development Permits	-	-	-	-
Bituminous Shale Leases	1	-	1 439	0
Underground Storage Licences	-	-	-	-
Underground Storage Leases	-	-	-	-
Quarry Permits	318	-	-	(14)
Quarry Leases	7	-	481.26	0
Peat Licences (issued 1990)	0	-	-	-
Peat Licences	4	-	1 767	0
Peat Leases	27	-	10 841	0

EXPLORATION	Number	Length (m)	Value ($)
Assessment Reports	148		6 036 321
Drilling	Not Avail.	Not Avail.	Not Avail.
Potash Exploration Expenditure			-
Drilling	-	-	-
Oil-Gas Exploration Expenditure			-
Drilling	-	-	-
Bituminous Shale Expenditure			-

* Based on number of hectares, where applicable.

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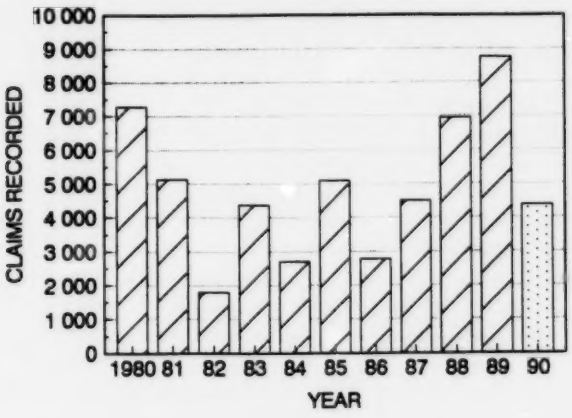

Figure 5. Mineral claims recorded, 1980 to 1990.

following is a summary of development activity that took place in the Province during 1990.

Marshall Minerals Corp. After acquiring the mineral rights to the Restigouche deposit (Figure 2: 21) in March of 1988, Marshall Minerals Corp. embarked on an extensive drilling programme to further define the reserves and processibility of the ore. One million (1 000 000) tonnes of proven reserves grade 7.75% zinc, 5.99% lead, 0.32% copper, 124.1 g/t silver, and 1.2 g/t gold (Northern Miner, November 26, 1990). In February, 1989, Marshall registered for screening under New Brunswick's Environmental Impact Assessment (EIA) Regulation and was subsequently screened in. The company completed its EIA report for the project and in August, 1990, the Lieutenant-Governor-in-Council gave approval for the development to proceed. A security bond of $1 600 000 will be required to ensure the environmental integrity of the operation.

Because the deposit is not large enough to support a mill, the company had hoped to enter into an agreement with a local mill to process its ore. It is expected that about $3 000 000 will be needed to bring the property into production and that production would average 1500 t/d from an open pit operation that would employ 50 people for a period of 4 years. Drilling indicates 1 200 000 t of ore grading 0.35% copper, 5.96% lead, 7.71% zinc, 124.1 g/t silver, and 1.2 g/t gold. Marshall had proceeded no further than the EIA approval when the deposit was put up for sale. The 17-month EIA process, the sharp downturn in zinc prices, and the closure of the Caribou operation all contributed in motivating the company to concentrate on development of a gold property in the Ivory Coast of West Africa.

Stratabound Minerals Corp. In December, 1987, Stratabound Minerals Corp. obtained the mineral rights to the Captain North Extension (CNE) deposit (Figure 2: 22), located approximately 11 km from the Heath Steele property. During 1988-89 drilling and trenching programmes were carried out with very positive results, indicating a high-grade, low-tonnage zinc-lead-copper-silver deposit about 6 m below surface. In initial bench-scale metallurgical tests, concentrate recoveries were high and grades were acceptable. Based on these results, Stratabound registered the project under the Environmental Impact Assessment Regulation; the project was screened out with conditions.

After the screening, Stratabound applied to the Department of Natural Resources and Energy and received approval to remove a 12 000 t bulk sample to determine the metallurgy of the ore. The bulk sample was removed in September and milled at the nearby Heath Steele Mines facility where it yielded an average grade of 12% zinc, 5.57% lead, and 171.4 g/t silver (Northern Miner, November 5, 1990). Discussions are proceeding with Heath Steele Mines concerning a 1991-92 milling contract and a feasibility study is underway to confirm the economic viability of

the CNE deposit. Stratabound is currently in the process of obtaining other required government approvals before making production decisions.

Industrial Minerals

Two new operations may enter the aggregate supply business in the near future. Both are located in southern New Brunswick. The Tucker Mountain Stone and Boulder Company hopes to develop a crushed stone quarry near Elgin (Figure 4: 19), southwest of Moncton in Albert County, to supply both high-quality aggregate and related stone products. At the Port of Bayside (Figure 4: 20), L.E. Shaw Limited has entered into an agreement with the Department of Commerce and Technology to develop a tidewater quarry site for aggregate export. In northern New Brunswick, quarry expansions are expected to take place in association with the construction of a new electrical generating station at Belledune, north of Bathurst.

OPERATING MINES, WELLS, AND QUARRIES

Production Statistics

The preliminary estimate of the value of New Brunswick's mineral production for 1990 is $886 095 000 (Table 2). It represents a 2.5% increase over the final 1989 value of $864 073 000 (Figure 6). The marginal increase was the result of a combination of events: fluctuating metal prices, mine closures, and labour disputes.

The total value of metals produced was $596 003 000, representing 66% of the total value of production. Zinc continues to be the largest contributor to the metals segment of the industry, with a value of $480 989 000. The 24% increase in zinc production can be attributed to production from the Heath Steele and Caribou mines. The increased production and lower zinc prices resulted in an 11% net increase in the value of zinc.

Lead, the second most valuable metal produced in the Province, contributed $61 380 000, a decrease of slightly less than 10% from the 1989 value. Decreased production offset by a slightly higher average price for the year brought about this decline. In 1990, silver declined almost 50% in value as a result of decreased production and prices that reached a 14-year low. The value of copper also decreased by 20%; however, this was mainly due to the strike at Brunswick Mining and Smelting Corporation Limited since prices remained similar to those of 1989.

New Brunswick is no longer the largest primary producer of antimony in North America. In January, 1990, Dominion Explorers Inc. closed its Lake George mine. The antimony contribution from the operation for 1990 was $250 000. The value of bismuth and cadmium production ($796 000 and $184 000, respectively) had decreased by 62% and 78%, respectively, because of lower prices and decreased production at the Brunswick mine.

The value of gold to the Province rose more than 100% in 1990. This is attributed to NovaGold's Murray Brook operation, the newest and only primary producer of gold in New Brunswick. The operation ran for a full year at peak production. Gold as a byproduct of some base-metal operations also contributes to the value of production.

Nonmetals contribute about 23% ($206 533 000) of the total value of minerals produced. This marginal increase over 1989 is attributed to increased potash production. Potash is by far the major contributor to the nonmetals sector. A drop in potash prices was not enough to offset the effect of the increased production. In addition to potash, both peat and sulphur (from smelter gas)

TABLE 2. MINERAL PRODUCTION IN NEW BRUNSWICK, 1990
(Compiled from Energy, Mines and Resources statistics)

Preliminary Estimate

METALS	Units	Quantity	Value ($)
Antimony	kg	119 000	250 000
Bismuth	kg	89 000	796 000
Cadmium	kg	21 000	184 000
Copper	kg	6 475 000	20 720 000
Gold	g	744 000	10 730 000
Lead	kg	51 278 000	61 380 000
Silver	kg	115 000	20 954 000
Zinc	kg	249 605 000	480 989 000
TOTAL			596 003 000
NONMETALS			
Marl	t	---	---
Peat	t	275 000	28 273 000
Potash	t	---	---
Salt	t	---	---
Sulphur (in smelter gas)	t	74 000	10 025 000
TOTAL			206 533 000
FUELS			
Coal	t	550 000	37 400 000
Natural Gas	m^3	---	---
Petroleum Crude	m^3	---	---
TOTAL			37 400 000
STRUCTURAL MATERIALS			
Clay products	t	---	---
Lime	t	---	---
Sand and Gravel*	t	10 398 000	18 453 000
Stone	t	2 756 000	17 290 000
TOTAL			46 159 000
GRAND TOTAL 1990 (CDN $), preliminary			$886 095 000
GRAND TOTAL 1989 (CDN $)			$864 073 000
GRAND TOTAL 1988 (CDN $)			$910 764 000

* includes silica

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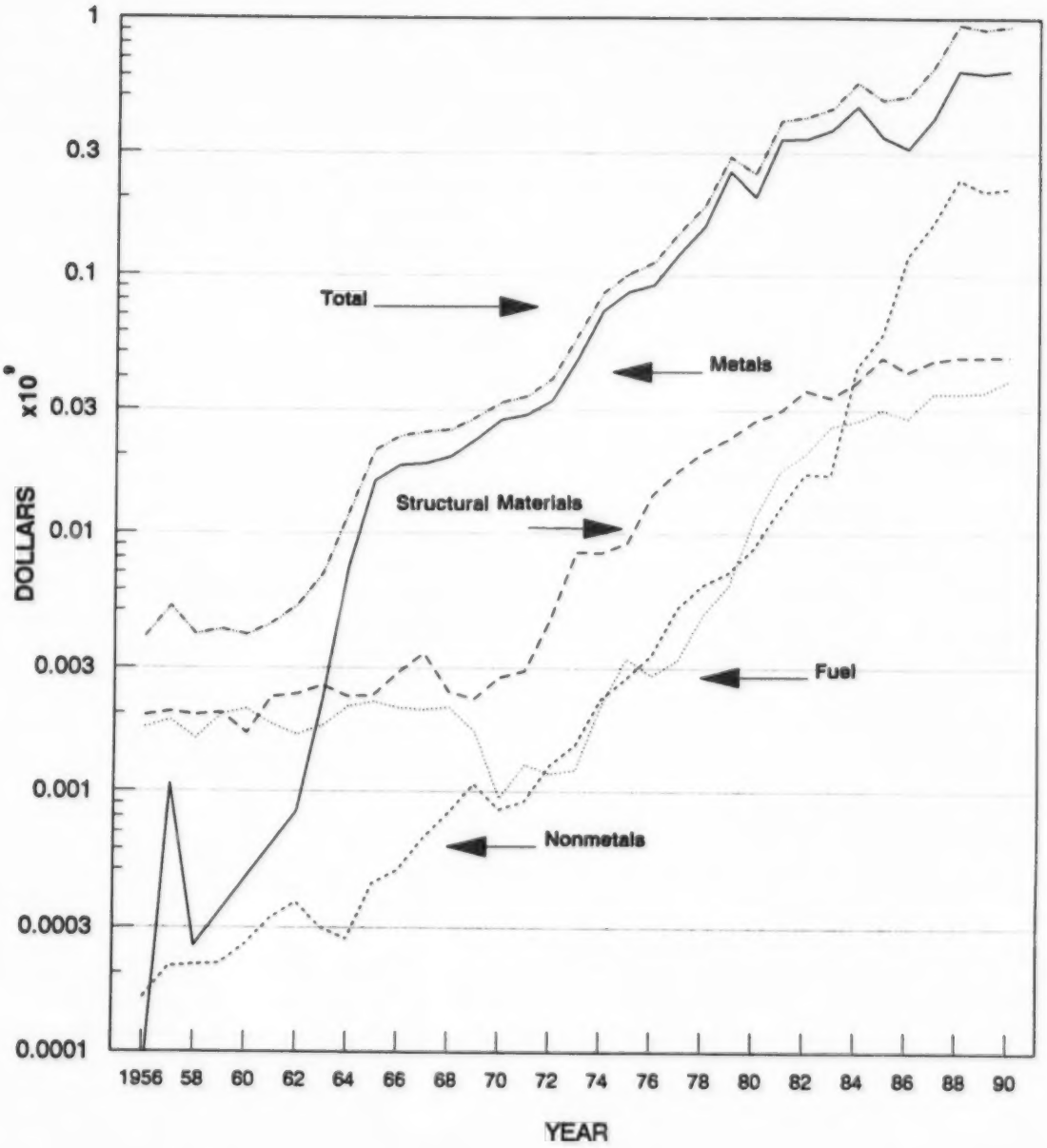

Figure 6. Value of mineral production in New Brunswick, 1956-1990 ($1986 = 100).

contribute significantly to the nonmetals sector; salt, silica and marl make minor contributions. Except for peat and potash, most provincial industrial minerals (nonmetals and structural materials) are consumed domestically. Therefore, sales and production are sensitive to the local economy.

The value of coal produced by N.B. Coal Limited in Minto was $37 400 000. This 11% increase from 1989 is attributed to both increased production and price. No oil was produced in the Province in 1990; natural gas production increased slightly.

Structural materials (lime, stone, clay, and sand and gravel) maintained a value of $46 159 000, equivalent to that of 1989. These commodities provide the raw materials for the construction industry in New Brunswick. During 1990, L.E. Shaw Limited closed its brick plant in Chipman.

In 1990, New Brunswick ranked first in Canada in the production of bismuth and marl, and second in antimony, lead, zinc, peat, and potash. Overall New Brunswick ranks eighth out of twelve provinces and territories in its value of mineral production.

Metallic Minerals

Brunswick Mining and Smelting Corporation Limited mines Canada's largest zinc deposit and operates the world's largest zinc mine (Figure 2: 1). Forecasts in 1989, Brunswick's 25th anniversary, indicated a record-breaking year for 1990. However, a labour dispute resulted in the mine operating at one third its capacity for more than half of the year.

The year commenced with an austerity programme that included the elimination of jobs at both the smelter and the mine, mainly through attrition.

During the winter, two planned shutdowns at the smelter helped compensate for the lack of smelter feed from the mine. This was an attempt to rectify the mine's poor fourth quarter production experienced in 1989 and to improve overall operational efficiency and cost effectiveness.

On July 4, 1100 mine workers went on strike after rejecting the company's final offer, which included a 20% salary increase over three years. Following this, smelter workers conducted a wildcat strike in protest of the results of a medical health study that indicated significant toxic metal levels and hearing loss in smelter workers. On July 22, the 440 smelter workers officially went on strike. The major concerns of the unionized workers were wages, length of contract, cost of living allowance (COLA), and pension.

To date there has been limited discord between the union and management. The union was fined for disrupting train access to both the mine and the smelter. The final few months of 1990 were uneventful. In December, Brunswick made another offer to the union but it was rejected.

Following the commencement of the strike, management and staff began operating the mine, mill, and smelter intermittently. Although production has varied between 20% and 25%, in the third quarter the Corporation was breaking even on operating costs (includes Heath Steele Mines). Brunswick had an overall profit of $25 000 000 for the year.

Dominion Explorers Inc. closed the Lake George antimony mine (Figure 4: 17) on January 19, 1990. If no other use can be found for the property, reclamation will commence in accordance with the Mining Act.

East West Caribou Mining Limited Following the official opening of the Caribou mine (Figure 2: 14) in June

of 1989, production and financial concerns resulted in the layoff of the majority of the workforce in August. A period of restructuring (both financial and ownership) followed. In January, 1990, the operation recommenced production. At that time, Bathurst Base Metals Corporation (controlled by British financier Howard Miller) held dominant interest in the operation. Breakwater Resources Ltd., contracted to manage the operation, subcontracted J.S. Redpath to implement the proposed modifications to the mine plan. The revised plan included a change in mining method from cut and fill to open stoping, the sinking of a 3-compartment, 1000-foot shaft, and increasing daily tonnage to 2500 t.

In September, 1990, Breakwater Resources Ltd. secured 100% interest in the Caribou property through an amalgamation with Bathurst Base Metals Corporation. The merger was based on a share exchange that included one Breakwater share for each 3.75 shares of Bathurst. The two companies agreed to restructure the mine's $30 000 000 debt with two Australian banks and Breakwater has agreed to fund the development of the mine to completion.

By October the operation had exceeded planned daily production and was running at 2800 t/d.

On October 26, East West Caribou Mining Limited announced that the mine would shut down due to a significant decrease in the price of zinc, the current economic recession, and the Persian Gulf crisis. Any decision to restart the operation would be market driven. In addition, senior officials indicated that a capital expenditure of $15 000 000 would be required to restart the operation. This expenditure is needed to extend underground development and to increase mill production to 3000 t/d. The immediate result of this announcement was the layoff of 215 people; approximately 15 were retained for care and maintenance.

The mine contains proven reserves of 1 900 000 t grading 7.93% zinc and 3.58% lead. In addition, there are 10 000 000 t of ore in the probable and possible catagories.

Heath Steele Mines, a division of Brunswick Mining and Smelting Corporation Limited On February 20, 1989 a decision was made by Noranda Exploration Company, Limited to proceed with the reopening of the Heath Steele mine (Figure 2: 3). Both Brunswick and Noranda maintain controlling interest in the operation. The fact that Heath Steele will be able to share some common facilities with Brunswick was a major factor in the reopening of the mine.

Employment at Heath Steele is 280, reflecting a dramatic increase in productivity over the pre-shutdown period in the early 1980s when 600 people were employed.

The commissioning of the Heath Steele mill began in September 1989 with a design capacity of 2200 t/d and mill feed coming from three zones on the property (Stratmat, B-Zone, and E-Zone). Initial results were not encouraging, but the mill soon reached a consistent operating rate of 2900 t/d. The mill is being supplied from two ore zones (B-Zone and Stratmat), with two more scheduled to be developed (E-Zone and A,C,D Zone). This development is expected to extend the life of the mine from five years to seven. The company's active exploration programme could help extend the life of the mine well into the next century. The original capacity of the mill prior to its shutdown in 1983 was 3500 t/d. This places the mill in a position to consider custom milling of other local ores as a means to improve profits and, ultimately, prolong the life of the operation.

Products include a zinc and a bulk concentrate destined for Europe, lead concentrate for the Belldune smelter and Europe, and a copper concentrate for the Noranda

smelter in Valleyfield, P.Q.

Murray Brook Resources Incorporated (a wholly owned subsidiary of NovaGold Resources Inc.) On October 27, 1989, the Hon. Frank McKenna officially opened the Murray Brook mine (Figure 2: 10). The massive sulphide deposit is capped by a precious-metal-bearing gossan cap containing approximately 1 540 000 t of ore grading 1.27 g/t gold and 51.1 g/t silver. The gossan is being mined currently; initial processing indicates a milling rate of approximately 1150 t/d and recoveries for gold to be greater than 80%. Both of these rates are in excess of the original design. The processing facility is one of only three in the world that is totally enclosed. As a result, both efficiency and environmental integrity are enhanced: ore can be leached on a year-round basis and airborne or liquid effluent from the operation can be strictly controlled.

By January, 1990, Murray Brook had produced 1000 kg of gold dore containing 111 972.5 g of gold and 933.1 kg of silver. By September 415 568.9 g of gold and 2735 kg of silver had been produced. Although initial rates and recoveries were in excess of design, cold feed in the winter months (January and February) reduced recoveries in the extraction process by approximately 50%. The company in conjunction with the Provincial government reviewed the possibility of using an ore preheater. The installation of the preheater resulted in a winter recovery rate similar to that of warmer months (approximately 85%).

NovaGold is also conducting an exploratory review of the copper zone. Drilling was performed in advance of mining the present open pit; initial results indicate approximately 300 000 t grading 4.68% copper. The feasibility of processing the copper is under review by the company and the federal government (CANMET). If results of this study are positive, mining of the copper zone will be considered.

Fuels

Production of coal from the Minto-Chipman area (Figure 4, 21) by **N.B. Coal Limited** increased in 1990 to 533 500 t. The coal is supplied to the N.B. Power generating facility at Dalhousie and Grand Lake.

Site preparation has commenced in the Coal Creek area for the erection of the 35-yard Bucyrus Erie 1260 dragline, which should be in operation in 1992.

In 1990, N.B. Coal Limited had disturbed 250 acres and reclaimed 400 acres in the coalfield. The company has caught up with past reclamation obligations and in the future is required to reclaim only the land it mines.

Irving Oil Limited continued to produce natural gas from the Stoney Creek oil and gas field (Figure 4: 22). Production in 1990 was 1 064 644 m^3 of natural gas.

Industrial Minerals

About a dozen industrial minerals are mined in the Province. They fall into three categories: (1) 'consolidated' rocks or minerals such as potash, salt, building stone, shale, granite, limestone, dolomite, silica, and gypsum; (2) unconsolidated commodities such as marl, sand and gravel, clay, soil and peat; and (3) industrial mineral byproducts such as sulphur.

The strategic location and development of suitable sources of high-specification bedrock aggregate are important because of plans to upgrade the Province's highway system, particularly the Trans-Canada Highway and its arterial

roads. Considerable expansion of some producing quarries and the establishment of new strategically located enterprises are expected. There is also potential for export to the northeastern United States.

Aggregate, an important part of the Province's construction industry, is derived from granular and bedrock deposits. More than 60 companies produce aggregate from numerous pits and quarries throughout the Province.

Most sand and gravel pits in New Brunswick are operated on an intermittent, on-demand basis. While many produce low-specification material, a few companies produce good quality material from large sand and gravel deposits. These are more permanent operations that lie within economical trucking distance of high-demand urban areas. The pits and processing facilities of **Brunswick Ready-Mix Concrete Ltd.** are at Blagdon, 25 km north of Saint John (Figure 4: 23).

Historically, aggregate from bedrock sources has been produced from ten to twelve quarries within the Province. There are large quarries in the Moncton, Saint John, and Fredericton areas with smaller ones in the Campbellton, Havelock, and Elmtree areas.

The New Brunswick limestone industry consists of five producers: Brookville Manufacturing Company Ltd. near Saint John (Figure 4: 24), Lafarge Canada Inc. and Havelock Lime west of Moncton (Figure 4: 25-26), Elmtree Resources Ltd. north of Bathurst (Figure 2: 23), and Upper Kent Lime Works Ltd. north of Woodstock (Figure 1: 2). These operations produce several hundred thousand tonnes of limestone annually.

Brookville Manufacturing Company Ltd. produces agricultural dolomitic limestone, fertilizer filler, roofing granules, concrete and asphalt aggregate, driveway aggregate, road metal and hardpack road subbase from its quarries at Brookville in East Saint John (Figure 4: 24). Annual production generally exceeds 200 000 t of limestone/dolomite.

Lafarge Canada Inc. operates a quarry several kilometres east of Havelock in Westmorland County (Figure 4: 25). Cement was produced at this location on a regular basis until the early 1980s. After 1982, production of cement from local raw material was limited to fulfilling market requirements for oil well and other specialty cements. The plant was maintained as a grinding operation for imported Nova Scotia clinker until 1987 when the operations were suspended indefinitely. The plant now serves as a distribution point for products from other company operations. The plant's adjacent limestone quarry continues to be operated, supplying raw limestone to Havelock Lime. Aggregate is also supplied to a subsidiary company, Permanent Concrete Ltd.

Havelock Lime (a division of Dickenson Mines Ltd.), at Havelock (Figure 4: 26), produces calcitic agricultural lime, industrial and chemical process stone, and crushed stone for aggregate. Havelock Lime is Atlantic Canada's only producer of calcined and hydrated lime. Annual quarry output and crusher feed generally exceeds 300 000 t. A recently installed Fuller annular-shaft kiln, the first of its kind in North America, has increased the calcining capacity of the operation to approximately 300 t/d. A new 9 t/h hydrator was commissioned in 1989.

Traditionally, the source of supply for the operation has been a quarry at Samphill. In recent years, the high ratio of overburden to limestone at this quarry has limited production. As a result, Havelock Lime has negotiated a long-term agreement with Lafarge Canada Inc. to ensure supply from a nearby quarry.

Elmtree Resources Ltd. operates a quarry and crushing and

pulverizing plant about 20 km north of Bathurst near the Village of Petit Rocher (Figure 2, 23). Annual production exceeds 50 000 t. Limestone is sold primarily to the lead smelter at Belledune as flux and, to a lesser extent, to other customers as aggregate, fertilizer filler, and agricultural limestone. Although remaining limestone reserves at a quarry adjacent to the processing facility are limited, two other deposits in the region have recently been evaluated. These have inferred reserves probably sufficient for several decades at current production levels. In 1990, the company announced plans to expand its processing capabilities by purchasing a new crushing plant and dryer.

Upper Kent Lime Works Ltd. produces marl from the bed of a small drained lake (White Mud Lake) at Maplehurst, Carleton County (Figure 1: 2). Annual marl sales to the region's farmers probably do not exceed a few thousand tonnes.

In February, 1990, **L.E. Shaw Limited** announced the indefinite closure of its brick manufacturing facility at Chipman, 60 km east of Fredericton, after nearly 60 years of operation.

Dimension stone in the form of various sandstone and granite products have been quarried and fabricated in New Brunswick for many years. There has been a modest revival of interest in the Province's dimension stone, mainly in the fields of restoration and renovation (e.g., buildings and bridges).

Smith Cut Stone and Quarries Limited, in Westmorland County, has produced an olive-green sandstone at its Shediac facility (Figure 1: 3) since the early 1800s. The company also utilizes this facility to process stone from a variety of locations.

Nelson Monuments Ltd., Sussex (Figure 4: 27), is the largest dimension stone company in the Maritimes. The firm presently owns several granite quarries throughout southern New Brunswick, including Spoon Island, Dawson Mountain, and Digdeguash Lake. They are generally operated on a demand basis. The Spoon Island quarry is the most active. The company uses mainly imported stone to produce monuments. Bases for memorial stones, curbing stone, and many custom-made products are manufactured from domestic stone resources.

Dupuis Cut Stone Ltd. manufactures ornamental and landscape stone products at its facility near Shediac, Westmorland County (Figure 1: 4).

One of several abandoned quarries in the Fort Folly Point area south of Moncton (Figure 4: 28) was reactivated in 1989 by **Maritime Stoneworks Ltd.**, and continued to operate on a demand basis, supplying sandstone for both new construction and restoration projects.

The potash industry continues to form the backbone of New Brunswick's industrial mineral production. In 1988, production reached a record high level of about 1 600 000 t, representing 86% of the Province's rated production capacity. A slight reduction to about 1 500 000 t in 1989 was brought about by weaker than anticipated potash markets and by opeational problems at one of the mines.

Two companies operate potash mines and associated processing facilities.

Potash Company of America (a division of Rio Algom Ltd.) operates the potash mine and concentrating facility in the Sussex area (Figure 4: 29). The company also operates a potash shipping terminal at Saint John, less than 80 km to the southwest.

In June of 1978, Potash Company of America and the Province of New Brunswick signed a mining lease covering an area of 19 187 ha.

Mining began in 1983, but at a level much lower than the mine's

rated capacity of 380 000 t K_2O annually. A number of technical improvements at the Potash Company of America mine over the last two years have resulted in record levels of ore production and mill recovery. The facility operated at 95% capacity in 1989.

A cut-and-fill mining method is employed in the mine, where continuous mining machines are utilized.

Denison-Potacan Potash Company commenced production at its Clover Hill mine (Figure 4: 30) in July of 1985, after about six years of shaft sinking, exploration and construction.

Modified room-and-pillar mining methods employing both continuous mining equipment and drill-and-blast technology are used to extract ore several hundred metres below surface.

In 1989 the mine achieved production levels near 70% of design capacity (780 000 t K_2O). Recent implementation of a hydraulic backfill system should ultimately improve ore extraction rates. A new crystallization circuit in the mill has raised recovery rates to 90.4%. Innovations to the compaction and screening stages of the milling process have enhanced product separation and quality.

Potash from both Sussex area mines is transported to the Port of Saint John. At the port, it is stored in buildings having a capacity exceeding 100 000 t.

In 1988, **Elmtree Resources Limited** acquired the silica quarry at Bass River, about 7 km east of Bathurst (Figure 2: 24). The company intends to operate the quarry pending market demand.

Sussex Silica Inc. has been operating a quarry near Cassidy Lake since 1986. The deposit, located 22 km southwest of Sussex (Figure 4, 31), consists of unconsolidated quartzose sand and gravel. The material is extracted from an open pit, washed, and screened. The product is marketed for use as smelter flux, silicon metal, silicon carbide, and sand blasting and decorative sand. In 1989, a sample of the sand was tested and proved satisfactory for the manufacture of glass.

Capacity of the Sussex Silica operation is estimated to be 80 000 t annually. There is potential for expansion if market demand warrants.

Peat Preliminary figures indicate that peat shipments in 1990 totalled about 6 500 000 standard bales (225 000 t), an increase from 1989. Production in 1990 was affected by poor climatic conditions in late July and early August.

Twelve companies were producing from twenty-three bogs and two other bogs were under development.

During peak production, approximately 920 people (including seasonal workers) were employed.

A preliminary estimate of of the value of 1990 shipments is $30 000 000.

ACKNOWLEDGEMENTS

The editor wishes to thank all staff members of Mineral Resources who contributed text and techical expertise toward the preparation of this report. Major contributions of text were made by J.L. Davies, A.A. Ruitenberg, S.R. McCutcheon, S. McEwan, T.C. Webb, and R. Shaw. Information and statistics were also provided by E.V. Jackson, F.J. Edney, R. Phillips, J.J. Thibault, R. Shaw, P.C. O'Leary, and D.J.J. Carroll. Figures were drafted or updated by L.G. Johnson and P. Evans.